IMAGE SENSOR, IMAGING APPARATUS, AND IMAGING METHOD

CROSS REFERENCES TO RELATED APPLICATIONS

The present application is a Continuation of application Ser. No. 13/533,363, filed Jun. 26, 2012, which claims priority to Japanese Patent Application JP 2011-168946 filed in the Japanese Patent Office on Aug. 2, 2011. The entire contents of these applications are incorporated herein by reference.

BACKGROUND

The present disclosure relates to image sensors, imaging apparatus, and imaging methods. More particularly, the present disclosure relates to an image sensor, imaging apparatus and imaging method capable of more accurately correcting color mixing.

In the related art, there has been proposed a method of pre-setting a color mixing correction coefficient and correcting color mixing by using the color mixing correction coefficient (see, e.g., Japanese Patent Laid-open No. 2010-16419).

There has been also proposed a method of providing a color mixing detection pixel at an optical black area (OPB area) outside an effective pixel as a method of dynamically correcting color mixing (see, e.g., Japanese Patent Laid-open No. 2010-239192).

Further, there has been also proposed a method of providing an OPB within an effective pixel (see, e.g., Japanese Patent Laid-open No. 2010-147785).

SUMMARY

However, in the method of pre-setting the color mixing correction coefficient value which is described in Japanese Patent Laid-open No. 2010-16419, the manufacturing variations (for example, film thickness of color filter, or positional aberration of on-chip lens) have not been contemplated. Since color mixing ratio is changed depending on a light wavelength as well as a light source or a subject to be picked up, the method of pre-setting the color mixing correction coefficient has not contemplated on such cases.

Further, in the method described in Japanese Patent Laid-open No. 2010-239192, if a color mixing detecting pixel is provided at an area outside of the effective pixel, then the angle of incidence within the effective pixel is different from the angle of incidence outside of the effective pixel because the amount of color mixing is a value which is changed depending on the angle of light incidence. Accordingly, it is not possible to obtain the accurate amount of color mixing.

Moreover, in the method described in Japanese Patent Laid-open No. 2010-147785, the color mixing caused within Si has been not contemplated. If an OPB is provided only at a pixel of particular color, then, as well as black level, a color mixing being entered into the pixel is outputted. If the value is subtracted from other color pixel, then there is a possibility that the obtained color mixing ratio will be inaccurate because the color mixing is varied depending on colors. In addition, since the amount of color mixing is varied depending on image height (position within image sensor), it is necessary to perform an operation considering the optical distance. However, the method described in Japanese Patent Laid-open No. 2010-147785 has not mentioned about it.

In view of the foregoing, it is desirable to provide a technology capable of more accurately correcting color mixing.

According to an embodiment of the present disclosure, there is provided an image sensor which includes a normal pixel group composed of a plurality of normal pixels in which each of the normal pixels has a photoelectric conversion device for photoelectrically converting an incident light, and a detection pixel configured to detect a light incident from a neighboring pixel by the photoelectric conversion device within an effective pixel area of the normal pixel group.

The detection pixel may further include a light shielding film configured to shield an incident light incident upon the detection pixel from outside.

The light shielding film may be formed by a wiring layer.

The light shielding film may formed by a plurality of wiring layers.

Each of the wiring layers may have a gap formed thereon at different positions from each other.

Each of the wiring layers may be arranged depending on an incident angle of an incident light.

The light shielding film may be formed by a metal disposed on the photoelectric conversion device.

The image sensor may include a plurality of the detection pixels.

The image sensor may further include a filter configured to transmit an incident light of a predetermined wavelength. A result obtained by detecting a light incident from the neighboring pixel by the detection pixel may be used to correct a pixel value of a normal pixel provided with a filter configured to transmit an incident light having the same wavelength as a filter provided at the detection pixel.

The detection pixels may be provided in positions that are not contiguous with each other.

According to another embodiment of the present disclosure, there is provided an imaging apparatus which includes an image sensor and a subtraction unit. the image sensor includes a normal pixel group composed of a plurality of normal pixels in which each of the normal pixels has a photoelectric conversion device for photoelectrically converting an incident light, and a detection pixel configured to detect a light incident from a neighboring pixel by the photoelectric conversion device within an effective pixel area of the normal pixel group. The subtraction unit is configured to subtract a light amount of a light incident from a neighboring pixel of the normal pixel from a pixel value of the normal pixel by using a light amount of a light detected by the detection pixel of the image sensor.

The subtraction unit may include a selection unit configured to select a detection pixel to be used in subtracting the light amount, a light amount calculation unit configured to calculate the light amount included in a pixel value of a normal pixel to be processed using a pixel value of the detection pixel selected by the selection unit, and a light amount subtraction unit configured to subtract the light amount calculated by the light amount calculation unit from a pixel value of a normal pixel to be processed.

The selection unit may select a plurality of detection pixels. The light amount calculation unit may calculate the light amount by adding a weight to each pixel value of the plurality of detection pixels depending on a positional relationship between the plurality of detection pixels selected by the selection unit and a normal pixel to be processed.

The light amount calculation unit may change the detection pixel used to calculate the light amount to another